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James Burtle

From: Gary Pearce KN4AQ [kn4aq@arrl.net]
Sent: Friday, May 21, 2004 1:49 PM
To: James Burtle; Len Anthony
Cc: Anh Wride; w1rfi@arrl.org; w4fal@smithchart.org; Bill Godwin
Subject: 4th Interference Complaint regarding Progress Energy Phase II BPL Interference

To:
James Burtle, FCC
Len Anthony, Progress Energy Regulatory Affairs

From: Gary Pearce KN4AQ
116 Waterfall Ct.
Cary, NC 27513
919-380-9944
kn4aq@arrl.net

cc:
Bill Godwin, Progress Energy
Anh Wride, FCC
Ed Hare, ARRL
Frank A. Lynch, ARRL

Thursday, May 21, 2004

This e-mail letter is an update of my third formal complaint of interference received from several Broadband over Power Line (BPL) installations operated by Progress Energy in the Wake County, North Carolina area, submitted on May 12, 2004. I'm updating it to directly address Mr. Burtle of the FCC, in case there was any confusion that I requested FCC action and a reply on the complaint, and to add that my May 4 observations were confirmed by a subsequent observation on May 19, 2004.

This complaint covers the ***continuation of interference*** noted in my second complaint, filed March 29, 2004. This interference has not been addressed as of an observation I made on May 4, 2004, and verified again on May 19, 2004, notwithstanding the claim in Mr. Anthony's April 20 e-mail to James Burtle that, "Since that time, further modifications have been made to address this fringe interference." (My complaints #1 and #2 are included at the end of this e-mail, for convenient reference.)

Before detailing the interference I monitored on May 4 and May 19, I must address the question of "what is harmful interference" in general, and the question of harmful interference to ***mobile*** operation, which Mr. Anthony dismissed in his April 20th e-mail.

First, the question of harmful interference. Amateur radio operators frequently operate at the margins of signal strength and quality. Signal strengths so weak that other services would consider them unusable are used routinely for amateur radio communication. We also tune across spectrum that contains no signals at all, looking for stations to contact. In our receivers, in the single sideband (voice) mode, Progress Energy's continuous series of BPL carriers appear as an always-present series of audio tones. The pitch of the tones depends on the exact frequency tuned, but there is always a tone somewhere in the prime spectrum for communications-quality audio, between 500 and 2500 Hz. This "seriously degrades" our radio communications service whether desired signals are being completely obscured or not.

Yes, this means that interference just above the ambient noise level at any given amateur radio station is harmful, as it

hanges the routine nature of operation that we have enjoyed since shortly after the dawn of radio. Progress Energy is ttempting to overlay a second, unlicensed radio service atop the spectrum allocated to a licensed service using Part 15 Rules that were never intended to apply to signals of this combination of coverage and duration. We will have no omplaint if there is truly no interference, if that can be accomplished. The technology you have deployed today does ot come close to meeting that goal.

Second, mobile operation is a perfectly valid form of amateur radio communication, and interference to it is no more cceptable than interference to fixed operation. The ability to drive away from interference may be an option for a nobile operator, but that does not remove the Part 15 liability of the operator of an unlicensed device to avoid harmful nterference, for several reasons. The mobile operator may drive in and out of multiple interference zones as he or she ravels down the road. The mobile operator may be in heavy traffic, or may be stopped by a traffic light, and what would be a minute of interference at 35 mph could extend to several minutes. And the mobile operator may stop in a driveway or parking lot for an extended period inside an interference zone. With no practical way to immediately nitigate this interference, the mobile operation will be seriously degraded.

In addition, keep in mind that Progress Energy is operating small trials in neighborhoods where there are no amateur radio operators. In these neighborhoods, we use mobiles as surrogates for fixed stations. In this role, the mobiles have a serious handicap. Their inefficient antennas do not permit reception of BPL signals at anywhere near the distances hat even simple dipole antennas at fixed stations do. To be specific, when driving away, perpendicular to the active overhead power line, the BPL signal fades to inaudible in 400 to 500 feet (not, by the way, the 90 feet Progress Energy suggested in comments on the Docket 04-37 NPRM). However, home stations, using dipole antennas, can hear the signals well as much as a mile away. Danny Hampton K4ITL lives on Rock Service Station Road, just north of Pagan Road, eight-tenths of a mile from the extractor on Holland Church Road near Feldman Road. In our January 15 observation (and many times since), he was able to hear the signal on that overhead line using a dipole antenna.

So to summarize these points, weak signals can and do create harmful interference, mobile stations are fully legitimate targets for harmful interference, and we are using mobiles to provide observations that would otherwise be available if there were any hams living in the trial areas.

Now, on to my May 4 observations.

On May 4, I positioned my mobile amateur radio station at the intersection of Holland Church Road and Elsie Lorraine Road, at the entrance to the Holland Meadows subdivision. This is near the power line used for BPL feeding the neighborhood.

I received signals with the Amperion "BPL signature" (mostly unmodulated carriers, 1.1 kHz apart, covering a large, continuous block of spectrum) from 14.195 to 21.45 MHz, including all or parts of the 20, 17 and 15-meter amateur bands. Within those overall limits, the BPL signal was strong on most frequencies, but there were some frequencies were the signal was fairly weak.

The signals from 14.195 to 14.290 were weak, but plainly audible above the ambient noise level. These are some of the "fringe" signals Mr Anthony refers to in his April 20 e-mail. I monitored several amateur radio transmissions in this spectrum, and while the signals did not obliterate any, they did present an annoying, continuous tone behind all of them on my single-sideband receiver.

The signals from 14.290 to 14.350, covering the top 60 kHz of the 20-meter amateur radio band, were "full strength," reaching "S-7" on my Icom 706 MKIIG transceiver and Outbacker Perth Plus antenna while on the highway adjacent to the power line. This is the same signal block I noted in my March 29, 2004 complaint. I have also observed that signal block on April 6 (a demonstration with Bill Godwin), April 13, April 21, and April 29, in addition to May 4 and May 19. It has not changed. It continues to be strong enough to make reception of weak and moderately strong amateur radio signals impossible.

The BPL signals continue full-strength through the 15.10-15.80 MHz and 17.50-17.90 MHz shortwave broadcast bands, and covered up some of the weaker stations while putting an annoying, continuous whistle (heterodyne) against some stronger signals.

The BPL signal does dip to just above the noise level in the 16.80 - 17.34 area. I believe this is the crossover area between downlink and uplink signals on this leg of power line.

The signal is also weaker from 18.075 - 18.185. This is the notch for the 17-meter amateur radio band. However, the signal is full strength in the bottom 7 kHz of the band, from 18.068, to 18.075. And the BPL signal continues to be clearly readable, though weak, throughout the band. In other words, the notch depth is not great enough to remove the signal completely when it is "S-7" outside the notch. It remains strong enough to obscure a weak ham signal, and presents a continuous, annoying heterodyne behind stronger signals. It also presents the usual, continuous series of carriers when tuning across unused frequencies while looking for stations to contact.

I estimate that a home station would get an audible signal as far as two blocks away. A ham on a lot within a half block of the line would get a fairly strong signal. And this is the configuration I assume Progress Energy would plan for the power lines in every neighborhood.

Inside the Holland Meadows neighborhood, where BPL is carried on underground power lines, the signals are weaker than those on the overhead lines. But they are still plainly audible and often much stronger than the "fringe" and "notched" signals on the overhead lines in the vicinity of the above-ground pedestals. At 1141 Feldman, I received signals from 2.5 MHz to 5.0 MHz, and from 5.95 MHz to about 9.7 MHz. This put full-strength signals across the 80 and 40-meter ham bands. I estimate that a home station would be able to hear these signals for a block or two as well. At 5528 Holland Church Rd, I received signals from a pedestal from about 6.35 to above 8.3 MHz, including full strength signals across the entire 40-meter band.

At the Woodchase neighborhood, in Fuquay-Varina, I parked along James Slaughter Road, just south of the entrance to the subdivision, on the west side of the road. The total spectrum in use here ran from 21.20 to 28.1 MHz, with a notch for the 12-meter ham band, and a crossover around 25 MHz.

From 21.2 to 21.47 MHz, the signal slowly ramps up in amplitude, with plainly audible signals in the 15-meter band from 21.35 to 21.45 MHz. At 21.47 MHz it jumps to full strength, interfering with a few shortwave broadcast signals in the 21.45 21.75 MHz range. The BPL signals fall off below the bottom of the 12-meter band, at 24.86, and remain weak to 25.20, where they became inaudible. Once again, the BPL signals were weak but audible throughout the entire 12-meter band. They fall off just below the 10-meter band at 28.0 MHz, but weak signals remain audible for another 100 kHz inside the ham band.

It would appear from the fact that the top 60 kHz of the 20-meter band and the bottom 7 kHz of the 17-meter band still have full-strength BPL carriers in them that this hardware is not that easy to control. The "fringe" carriers, and the signals remaining in the notched segments, suggest that it can't be just turned on and off where Progress Energy wants, at will, or controlled to the level that they (and we) might desire.

Progress Energy has obviously paid attention to our complaints, and taken steps to correct the problems that we've pointed out. Those steps have fallen short, both by leaving full-strength signals on parts of two Amateur Radio bands, and by leaving weak "fringe" or notched signals on other bands. Rather than dispute our claims, I suggest Progress Energy take our information to their vendor and ask why they can't make the hardware perform to the level claimed.

We disagree on the definition of "harmful interference" a critical point on which the FCC or a court will make the final determination. I can assure you that the Amateur Radio and shortwave listening communities will work hard to protect continued access to the radio spectrum without the ever-present beat of a BPL signal in either the foreground or

background of our receivers.

Sincerely,

Gary Pearce KN4AQ

Gary Pearce KN4AQ, March 29, 2004 complaint, for reference

919-380-9944

Monday, March 29, 2004
This e-mail letter is a second formal complaint of interference received from several Broadband over Power Line (BPL) installations operated by Progress Energy in the Wake County, North Carolina area. This complaint covers interference on NEW frequencies that was not present in my first complaint filed on March 13th.

In my March 13th complaint I detailed interference that I observed while operating my mobile amateur radio equipment in the vicinity of the Progress Energy Phase II BPL trial areas in southern Wake County, North Carolina. No one from either Progress Energy or the FCC has contacted me as a result of that complaint (except a request from the FCC to drop David Solomon from the recipient list, which I have done). I have seen Bill Godwin in a somewhat chance encounter at the Holland Church site, and we had a good discussion on the state of the trial.

I have observed that Progress Energy has changed the spectrum used for the overhead line segments in both trial areas. If I'm correctly assuming that this was done to respond to complaints, and demonstrate frequency agility and the ability to mitigate interference by avoiding amateur radio spectrum, the attempt is appreciated, but it was not completely successful. New amateur radio and shortwave spectrum is now receiving interference, and that is the basis of this complaint.

On March 20, 2004, in the Woodchase subdivision area near Fuquay-Varina, where BPL signals had covered the 12 and 10 meter bands, I observed clear, strong BPL signature signals from 21.5 to 24.90 MHz, and 25.49 to 28.0 MHz. This almost cleared amateur radio spectrum, but not quite.

The lower segment, from 21.50 to 24.90 MHz, encroached clearly on the bottom 10 kHz of the 12 meter band, from 24.89 to 24.90 MHz, and what I'll call "residual" BPL carriers - carriers at the edge of the main spectrum that trail off in amplitude over the course of 10 to 20 kHz - encroached further. The residual carriers present a correspondingly decreasing problem of interference, but when the bulk of the BPL carriers are strong, the residual carriers can also interfere with weak amateur radio signals.

Note that if a BPL operator is attempting to place a BPL block adjacent to the bottom of an amateur band, they should be aware that these residual carriers will fall across an area of extreme interest where amateurs use Morse code to communicate with distant, often very weak, amateurs in remote parts of the globe. Additional care should be taken to avoid letting this "residual" interference cross the bottom few kHz of any amateur band.

The higher segment, from 25.49 to 28.0 MHz, also left some residual carriers encroaching on the bottom of the 10 meter band at 28 MHz. The main carriers did cover all 40 CB channels and interfered with signals I monitored there.

Then I drove through the Holland Church Road trial site and observed no change since my March 13th complaint - the

BPL signals still covered the 12 and 10 meter ham bands and adjacent spectrum.

On March 23, 2004, I returned to the Holland Church Road trial area. That's when I ran into Bill Godwin and two other Progress Energy engineers, observing and reporting on some difficulty that Amperion was having moving the spectrum on the overhead line. The signals were gone from the 12 and 10 meter bands, and appeared erratically elsewhere. Since this was an effort in progress, I didn't worry about the signals I received.

On March 28, 2004, I returned to the Holland Church site again. This time I monitored signals on the following spectrum blocks:

14.29 - 16.805 MHz
17.33 - 21.00 MHz
24.53 - 28.00 MHz (with 12 meter notch?)

Reception was somewhat difficult because of a high general noise level (what we usually refer to as "power line noise," ironically in this case. The true source of this particular noise is unknown). The BPL signature signals were generally strong and clear above this noise.

After observing what appeared to be an attempt to completely avoid amateur radio spectrum at the Woodchase trial area, I was disappointed to see that two busy amateur radio bands were partially or fully covered here: 20 and 17 meters. The BPL carriers interfered with many signals as I tuned from 14.29 to the band-edge of 14.35 MHz in the 20 meter band. Strong signals were audible, but BPL carriers placed a loud "beat note" behind them, making reception irritating at best. Weaker signals were rendered unreadable.

I had the same situation across the entire 17 meter band, from 18.068 to 18.168 MHz. Weaker signals were impossible to receive, while stronger ones were accompanied by a loud heterodyne whistle.

I also tried listening to some shortwave broadcast signals in the spectrum immediately above the 20 meter ham band. Switching to AM reception with a 6 kHz band pass filter, I noticed that the BPL signals were a continuos "blanket" across the spectrum. Since the BPL carriers were 1.1 kHz apart, I heard the expected 1.1 kHz heterodyne tone as part of that interference blanket.

The 15 MHz signal from WWV was completely inaudible. Stronger shortwave signals were audible with varying degrees of interference. Weaker signals on 15.160, 15.205, 15.300, and 15.350 MHz were detectable but not readable. This was just a brief sample of the many shortwave signals that received interference from the BPL energy.

I could not observe any "residual" carriers spilling into the 15 meter ham band as the "power line noise" made it difficult to hear the weakest BPL carriers. With some difficulty I observed what appeared to be a notch in the 24.53 - 28.0 MHz block. The carriers were at least attenuated in the 24.89 - 24.99 MHz area (the 12 meter ham band), but I thought I could hear some weaker carriers through the "power line noise".

That is my report. I'll repeat my contention from my first complaint that interference reports from mobile stations are warranted because:

- amateur radio is a very mobile radio service,

- these are very limited trial areas, and the experience and results must be extrapolated to predict the effect BPL will have if widely deployed in densely populated areas.

I'll conclude with an example of truly random interference caused by BPL to a mobile ham who was not part of, or recruited by, our investigation team:

Over the past few weeks I've had an e-mail exchange with Andy Stoy K4MTN, from Wake Forest, NC. Initially, Andy's e-mail sounded like many that Tom Brown N4TAB, Frank Lynch W4FAL and I have received from area hams who suspect that they are hearing BPL interference from areas where none is known to exist. Andy said he had been hearing loud interference - he called it "static" - for months along a half-mile stretch of Falls of the Neuse Road near the Woodfield subdivision. He was describing the Phase I trial area which we believed to have been disconnected, and his description of "static" didn't sound like the BPL signature we're used to.

I pressed him for more specific details, and he finally described the exact location, and the signature sound (closer-spaced carriers with a clicking sound) of Amperion's BPL. Tom Brown traveled to the site and confirmed that the Phase I equipment was still operating on the overhead line along Falls of the Neuse Rd. Andy traveled that route daily, and regularly operates on the 10 meter band. He had been receiving interference and loss of communications on that stretch of road since at least last fall, but didn't know what caused the problem until we began publicizing the trials. Then he contacted us. He will be filing his own report of interference.

Andy's story may seem isolated, a rare, chance occurrence. It is significant for several reasons. One is that it happened at all, since there is a total of less than two miles of BPL coverage along Wake County highways. Another is that hams don't know what BPL is yet. We've reached a few with our message, but many more have never heard of it. So there may be a few more Andy Stoy's out there who have passed through the existing trials areas, received interference, and didn't know what it was or who to call.

I appreciate the fact that Progress Energy and Amperion are responding to our reports and complaints of interference. I'd prefer to just call them "reports," but public proclamations that "there have been no interference complaints" have pushed us to this formal posture. My goal is to make you (Progress Energy and the FCC) aware of the real conditions for radio amateurs and other HF spectrum users in the trial area so that you can anticipate the level of difficulty you can expect in a broader implementation.

I'd expect that Progress Energy and Amperion could completely avoid amateur radio spectrum in the overhead segments of this limited trial area. I'm surprised that after the first complaints, you moved to occupy different amateur radio spectrum. But even if you had completely missed ham bands in this first move, success in this limited arena is not a good predictor of the ability to mitigate interference in a full system, where you will be constrained to use more spectrum and not re-use spectrum for several line segments. And the question of interference from the underground line segments has not been addressed at all.

Sincerely,

Gary Pearce KN4AQ

Gary Pearce KN4AQ's March 13, 2004 complaint, for reference

I encountered all of this interference while mobile, or visiting the stations of other amateur radio operators. I do not hear any BPL interference at my home in Cary at this time.

November 16, 2003. I first encountered BPL interference on this date, near the Wakefield subdivision in north Raleigh, along Falls of the Neuse Road near Wakefield Pines Rd. The interference appeared as a series of closely spaced RF carriers, approximately 1 kHz apart, covering the lower half of the 10 meter amateur radio band, from 28 to near 29 MHz (and some spectrum below that band, including the 40 CB radio channels near 27 MHz). Some of the carriers had a little "tik-tik-tik" sound at about a 2 Hz rate. The interference was strong - S-9 - for about a half mile along Falls

of the Neuse Road, and obliterated several amateur radio signals that I was monitoring.

I understand this was the Phase I trial area, and the test has been discontinued.

January 15, 2004. On this and several subsequent dates, I received interference while driving along Holland Church road between 1010 Road and Pagan Rd. in southern Wake County, specifically in the vicinity of Feldman Dr. The signature of the interference was the same: closely spaced carriers, about 1 kHz apart, some with a tik-tik-tik modulation, and occasionally a longer burst of what sounded like data. The interference covered two blocks of spectrum, from 23.44 - 26.08 MHz (including the amateur radio 12 meter band) and 27.9 - 31.7 MHz, (including the amateur radio 10 meter band). The interference was strong - S-9 - for about a half mile along Holland Church road, and audible in places along Pagan Rd. It obliterated several amateur radio signals that I was monitoring as I drove through the area.

I also received interference with the same signature in several spots along Feldman Dr., in various other segments of the high-frequency spectrum - near 11 and 15 MHz in particular. The signals were weaker, but plainly audible. Onc caused a "beat note" against the 15 MHz WWV time and frequency reference signal.

I have subsequently been through this area several times, and the interference is still present. My last visit was on February 28th.

February 20, 2004. On this and several subsequent dates, I received interference while driving along NC Highway 55 and James Slaughter Rd, just north of the town of Fuquay-Varina. The interference was strongest along James Slaughter Road, opposite the Woodchase subdivision. Again, the signature of the interference was RF carriers, about 1 kHz apart, with a bit of digital modulation now and then, including the tik-tik-tik at about a 2 Hz rate.

This interference was across 21.9-25.7 MHz (including the amateur radio 12 meter band) and 27.5-30.0 MHz (including the amateur radio 10 meter band). The interference was S-9 along James Slaughter Road, and S-5 in the Food Lion parking lot at NC-55, and obliterated several amateur radio signals that I was monitoring.

In the Woodchase subdivision, I also heard the "BPL signature" signals on several other points in the high frequency spectrum. The signals were weaker, but plainly audible. I also heard signals in the 7 and 24.5 MHz area about a mile further north on James Slaughter Road, near the Whitehurst subdivision. These signals were S-6 to S-9 for about 1/4 mile along James Slaughter Road.

I most recently heard this interference on March 5th, 2004.

Finally, on February 28, 2004, I personally visited the homes of three amateur radio operators who live in the vicinity of the Progress Energy Phase II BPL trials, and observed interference as received at their stations as follows:

Mike Payne KM4UT
5813 HEATHILL CT
Raleigh, NC
Mile lives .7 miles south of the trial site on Holland Church Road. He is using a dipole antenna at about 30 feet. I observed that he was receiving a clear but weak BPL "signature" in the top half of the 10 meter band, above 28.8 MHz, and many smaller clusters of individual carriers in the band below that.

Ted Root N1UJ
509 WYNDHAM DR
Fuquay-Varina, NC
Ted is about a half mile southwest of the James Slaughter Road site. He is also using a dipole antenna at about 40 feet. He was receiving weak but clear BPL signature signals across the 25 and 28 MHz areas.

Roland Erickson WA0AFW
201 WILBON ROAD 301B
Fuquay-Varina, NC
Roland is about a half mile south of the James Slaughter Rd. site. He is using a dipole antenna in the attic of a retirement village building. He has a very high ambient noise level (S-6) across the 25 and 28 MHz bands, but was receiving the BPL signature signals clearly above that noise level across those bands.

You might ask if my complaint of interference while mobile, some distance from my home, is justified. I contend that it is, for several reasons.

First, amateur radio is a very "mobile" service. Tens of thousands of amateur radio operators have and use high frequency mobile equipment, and we can be found anywhere, using all hf bands, at completely unpredictable times.

Second, the Progress Energy Phase II trials are in very limited area tests. There are no amateur radio operators living inside the neighborhoods being served, though there are several within interference range - about a mile. We are justified in traveling to the sites with normal amateur radio equipment, operated in a normal manner, to observe and complain about interference we receive. This observation must be extrapolated to a wider geographic area to anticipate the kind of interference that would be received if BPL were to be widely deployed, especially in denser suburban and urban neighborhoods.

You might also ask if weak BPL signals constitute harmful interference. I contend that they do. Amateur radio operation is unlike most other radio operation, in that amateurs tune across their band segments looking for signals. Often we are looking for weak signals from distant parts of the world. Our predominant modes are single sideband and cw. In those modes, a series of carriers 1 kHz apart presents a most irritating series of "beat notes" - tones that vary in pitch as the spectrum is tuned. At 1 kHz spacing, they are continuously present in a receiver using customary bandwidth filters. And even weak BPL signals can make weak amateur radio signals difficult or impossible to receive.

The presence of any BPL signal of any strength at either a home or mobile station at any location is an unwarranted incursion in the amateur radio bands, and is also a problem for anyone tuning shortwave broadcast or other radio services.

Thanks for your consideration. I look forward to hearing the results of the investigation into my complaints.

Sincerely,

Gary Pearce KN4AQ

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(send e-mail to be put on my "buddy list")

ames Burtle

'rom: Tom Brown N4TAB [n4tab@earthlink.net]

Sent: Thursday, June 10, 2004 5:09 PM

To: James Burtle; Alan Stillwell; Bruce Franca; Anh Wride; Len.S.Anthony@pgnmail.com; matt.oja@pgnmail.com; bill.godwin@pgnmail.com; W3KD@aol.com

Cc: Gary Pearce KN4AQ; John Covington, W4CC; Ed Hare W1RFI; dsumner@arrl.org; danny hampton K4ITL; Frank A. Lynch

Subject: Re: 8th RESEND - June 2, 2004 - Formal complaint - Progress Energy Part 15 devices

Mr. Burtle.

Thank you for your reply.

Central to my complaint is my belief that the subject system and equipment operated by Progress Energy is *not* licensed under any service allowing BPL operation and that while they were issued an Experimental License for a different geographic area, it is not applicable in the current situation. This was detailed within the first 4 paragraphs of my complaint. So, my continued belief is that, as regards the current trials in Southern Wake County, NC, Progress Energy is not a "licensee" in any sense, but rather an "operator" of Part 15 devices which are causing harmful interference (they were doing so as recently as Jun 7, 2004 according to my own observations) and not subject to *any* protection under Part 15 rules.

I have heard nothing further from Progress Energy in any form, following Mr. Len Anthony's email of April 20, 2004 in which he stated, on behalf of his organization, that they were in compliance with Part 15 and were not causing harmful interference. That was taken at face value as Progress Energy's terminal statement that they intended no further action. That being the case, it is incumbent upon the FCC to take Enforcement Action is prescribed by Part 15 rules. Progress Energy has already had six (6) months to clear interference from the allocated Amateur Spectrum and has not done so. Six months is certainly more than a reasonable interval to fix a problem if, indeed, it can be fixed. That it has not, undoubtedly means.that it cannot be fixed. That, or there is no incentive to follow the FCC rules.

With all due respect, Mr. Burtle, it's time to get this problem off the table and into Enforcement.

Very respectfully,

Tom Brown N4TAB
Wake Forest, NC

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James Burtle wrote:

> Mr. Brown,
>
> Thank you for your complaint. We are considering your complaints and working with the licensee. Please continue to copy us with complaints that you send to the licensee.
>
> Jim Burtle
>
> > -----Original Message-----
> > **From:** Tom Brown N4TAB [mailto:n4tab@earthlink.net]
> > **Sent:** Wednesday, June 02, 2004 3:18 PM
> > **To:** James Burtle; Alan Stillwell; Bruce Franca; Anh Wride; Len.S.Anthony@pgnmail.com;
~~~~~~

matt.oja@pgnmail.com; bill.godwin@pgnmail.com; W3KD@aol.com
Cc: Gary Pearce KN4AQ; John Covington, W4CC; Ed Hare W1RFI; dsumner@arrl.org; danny hampton K4ITL
Subject: 8th RESEND - June 2, 2004 - Formal complaint - Progress Energy Part 15 devices

To:
James Burtle, FCC
Alan Stillwell, FCC
Ann Wride, FCC
Riley Hollingsworth, FCC
Len Anthony, Progress Energy Corporation
Matt Oja, Progress Energy Corporation
Bill Godwin, Progress Energy Corporation
Chris Imlay, ARRL Counsel

Date: April 27, 2004

This complaint addresses the Progress Energy (Raleigh, NC) BPL trial areas situated along James Slaughter Road in southern Wake County, NC. This complaint should be considered in concert with previous complaints lodged with Progress Energy and The Federal Communications Commission regarding interference by devices operating under FCC Part 15 and which radiate harmful interference into the RF spectrum allocated to, and used by licensees of the Amateur Radio Service.

Notwithstanding previous efforts by Progress Energy and it's vendor, Amperion, Inc. to resolve outstanding complaints regarding interference to Amateur Radio spectrum, a recent correspondence from Mr. Len Anthony of Progress Energy states that his company's efforts had yielded results suitable to Progress Energy and that they would take no further action in this regard. This correspondence coldly and effectively terminates the good faith relationship that was engendered in October, 2003 with a view toward a cooperative effort that might yield a technical solution to an otherwise mutually adversarial situation.

In assessing the current technical aspects of the Progress Energy BPL trials, I believe that the interference described in this and previous complaints falls under Part 15 for the following reasons:

1) The Experimental license WD2XCA issued to Progress Energy (file number 0011-EX-PL-2003-granted February 10, 2003) allows operation of an experimental radiator within a 20 mile radius of the coordinates N35:56:58, W78:34:23. None of the 3 trial sites in southern Wake County are within this radius.

2) Mr. Len Anthony's correspondence of April 20, 2004 specifically refers to FCC Rules, Part 15 as their model for compliance.

Therefore, my complaint is that Progress Energy's BPL trial site(s) emit radiated RF components that are harmful to the spectrum allocated to the Amateur Radio Service by the FCC and also provided under international treaty.

In preface to the specifics of my complaint, I would like to put into perspective, the use of an Amateur Radio HF mobile radio in the trial areas. As it is remarkably convenient that there are only a small number of Amateur Radio operators geographically situated near the trial areas to hear the BPL signals from their homes, we have been,and are, using mobile HF equipment in the place of fixed installations in order to gauge the impact of interference in the respective geographical areas. Thus, an HF mobile radio, in the current context, is a "stand-in" for a fixed station at or near the same geographic location. It should be noted that, due to the generally poor efficiency and polarization of the HF mobile antennas, the results reported herein significantly *under-represent* the signal levels that would be encountered by fixed stations using horizontally polarized antennas, such as wire dipoles or directional arrays, operating in the same vicinity.

On Sunday, April 25, 2004, I drove my vehicle to the James Slaughter Road trial-site area. Upon arrival near the entrance to the Whitehurst residential subdivision, I began tuning through the allocated Amateur Radio bands and immediately observed significant interference to the 12 meter band, which extends from 24.890 mHz to 24.990 mHz. The interference was sufficient to mask, and did mask, useful signals that were clearly heard away from the BPL trial area. That the unique RF "signature" of the Progress Energy equipment completely blankets and renders useless an otherwise useful spectrum segment, clearly constitutes harmful interference.

This interference accrues into other portions of the allocated Amateur Radio HF spectrum, as well. Within the Whitehurst and Woodchase subdivisions (both adjacent to James Slaughter Road) BPL interference can be heard in the lower 25 kHz of the 10 meter band (28.000 mHz to 28.025 mHz).. In addition, near the entrance to the Whitehurst subdivision, the entire 40 meter band (7.000 mHz to 7.300 mHz) is obscured by BPL interference. This interference does not radiate from the overhead wires alone; radiation also occurs from the pedestals where the underground wiring connects to customer distribution equipment.

Note that this interference is not confined to a single, narrow tone (carrier) as would be experienced from a typical Part 15 device such as an answering machine. This BPL interference signature consists of carriers spaced at approximately 1 kHz intervals through the entire 12 meter band, rendering normal communications operation impossible.

Where apparent attempts by Progress Energy to vacate the Amateur Radio spectrum have occurred in these systems, it has become obvious that the characteristics of any built-in "mitigation" filters do not exhibit "sharp" edges and that the "granularity", or precision with which any such filters can be defined and applied, is quite coarse. That is to say, that it seems that it is not possible to apply a "brick wall" filter topology, cleanly "notching" spectrum segments, rather, the filter "corner" must be set (possibly empirically) considerably away from the desired edge of the spectrum to be avoided. This observation suggests that the oft-touted claims of an "adaptive mitigation" process are overstated, at best.

Members of the local Amateur Community, including the undersigned, have waited patiently for several months while Progress Energy and it's vendor have attempted, in fits and starts, to remove the allocated Amateur Radio spectrum from that spectrum utilized by their installed BPL systems. The result, after these months of observation, is that Progress Energy has not caused these systems to cease interference to the Amateur Radio spectrum.

There is a single conclusion that can be drawn from the history of this situation: interference from this type of system is a function of the design and cannot be mitigated, else it would have been accomplished by now. Further, it seems that this technology is quite immature and inherently lacking the technological merits so widely accorded it, owing to the lack of success following months of efforts toward effecting a solution.

FCC part 15 rules quoted below state that:

§ 15.5 General conditions of operation.

(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to § 90.63(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

Progress Energy is operating equipment under the terms of Part 15.5a, b and c above, and is subject to the restrictions therein.

I, therefore, respectfully demand that the Federal Communications Commission take the action specified under Part 15.5c and cause Progress Energy to cease operation of the Part 15 devices mentioned in this correspondence.

Respectfully,

Thomas A. Brown Amateur Radio licensee N4TAB
5525 Old Still Rd.
Wake Forest, NC
919-556-8477 (w)
919-528-3104 (h)
n4tab@earthlink.net

Attachments:

Previous complaints made to Progress Energy
Previous complaints made to the FCC
Copy of Mr. Len Anthony's email as referenced above

[Revision note: Paragraph 9 had two typographical errors that were subsequently mentioned in a follow-on errate email. Corrections were made in the foregoing paragraph 9 (only) and are underlined in both cases.}

ames Burtle

rom: Tom Brown N4TAB [n4tab@earthlink.net]

ient: Wednesday, September 29, 2004 4:59 PM

'o: James Burtle; Alan Stillwell; Bruce Franca; Riley Hollingsworth; Anh Wride; Len.S.Anthony@pgnmail.com; matt.oja@pgnmail.com; bill.godwin@pgnmail.com; W3KD@aol.com; Sheryl Wilkerson

:c: Gary Pearce KN4AQ; John Covington, W4CC; Ed Hare W1RFI; dsumner@arrl.org; danny hampton K4ITL

iubject: Reply and additional complaint - Progress Energy BPL systems - Wake County, NC

\ttn: Mr. Bruce Franca

)ear Mr. Franca,

Re: Progress Energy BPL systems - Wake County, NC

n response to your letter of July 22, 2004, I have attached my reply and additional complaint.

Respectfully,

Thomas A. Brown
Amateur Radio Licensee N4TAB
5525 Old Still Rd.
Wake Forest, NC 27587
919-556-8477 (w)
919-528-3104 (h)
919-971-3100 (c)
n4tab@earthlink.net

Federal Communications Commission
Washington, DC 20554

September 29, 2004

Attn: Mr. Bruce Franca

Response and further complaint

Dear Mr. Franca,

I thank you for your correspondence of July 22, 2004 and appreciate that you accorded sufficient credibility to my previous written complaint, that you and other staff members traveled to investigate this matter. I must say that I am quite surprised that, following a week's time on-site, you were unable to substantiate the details and severity of my compliant. I have considered your remarks in reply to my original complaint and I find the following:

- That your measurements of the "notched" BPL emissions at a site on James Slaughter Road in Wake County, reported by you to be at a level of ~24dB below the Part 15 emission limit for a point source radiator are wholly inconsequential and without merit as regards defining or excusing harmful interference under Part 15. I can find no reference that states that equipment operating under Part 15 with an emission level below some specified value is defined as being "non-interfering". This is a subjective leap of judgement that is unsupported under Part 15 Rules and without precedent. Quite the contrary, Part 15.5 a, b and c clearly states:

§ 15.5 General conditions of operation.

(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to § 90.63(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

Note that there is no mention of operating above or below any specified radiated level - <u>whatever</u> - and that any applied definition as such, is unsubstantiated in the Rules and therefore is without merit.

– That the observation that harmful interference was not heard on "a quality Amateur Radio receiver" is without merit. I have repeated my survey of the BPL sites at James Slaughter Road and at Holland Church Road and clearly observed and measured harmful interference at both locations. My comments below illustrate and support this conclusion.

First, to again put this into perspective, I reiterate the comment from my previous complaint, as regards the use of mobile HF equipment in observing and reporting the presence of harmful interference in the BPL sites mentioned. I am not solely reporting interference to an HF mobile radio in the Amateur Radio Service. I am reporting interference to a representative surrogate station operating in the same geographic area. To that end, I also note that my mobile antenna, while resonant, is 90 degrees opposed to the predominant polarization of the power line radiator and, therefore, captures a lesser percentage of the actual harmful interference.

In order to characterize and quantify the emission levels as regards harmful interference, I utilized a "quality Amateur Radio Receiver" and accessories, connected as shown in Figure 1 "Test Apparatus Configuration". For the tests conducted, I first noted the relative noise floor and adjusted the receiver gain to produce a reference reading of 100 mV on the associated Fluke model 77 meter (note that this is an RMS responding meter) at a location about 1 mile north of the BPL system site and within the same geographical area.

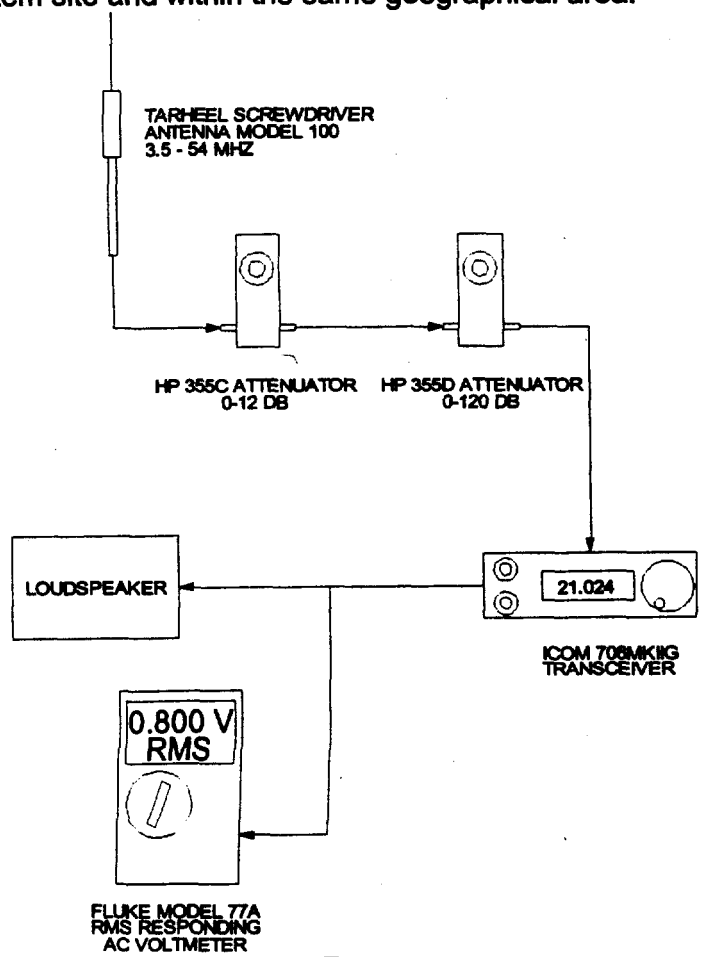

Figure 1
Test Apparatus Configuration

I then drove my vehicle to, and through, the BPL site area and noted the indicated signal level on the meter. A peak RMS level of BPL signal was noted and the vehicle stopped at a location where the value was recorded. RF attenuation was then applied to achieve the original 100 mV RMS reference level. The attenuation level was recorded.

The resulting measurement describes the amount of added RF signals, noise (HARMFUL INTERFERENCE) that results from the operating BPL system in the area of the test. This method was repeated at several locations and on frequencies and at times listed in this report.

The clear outcome of my series of tests is consequential, in that it clearly illustrates and quantifies the level of insult, or harmful interference from the subject systems. It is meaningless to suggest, as was done in your letter of July 22, 2004, that RF levels below some stated carrier level is some value, when that level does not consider the relative noise floor at the subject location. If the FCC observer does not know what level bounds the lower limit of what I can hear, how can he state that I received no interference? Moreover, if he was operating a "quality Amateur Radio Receiver" with a resonant antenna for the frequency of interest, he would have heard exactly what I heard and that am reporting in this correspondence. I am unable to understand why this did not, apparently, occur in the measurements mentioned in your letter.

I also do not see the disparity of measurements and observations as a matter of a difference of opinion. Opinion does not weigh into any interpretation of these observations. Part 15 is clear in its wording and states in an unambiguous fashion, what it intends to be the rules by which enforcement must take place.

It is difficult to understand how FCC personnel with a fully outfitted technical measurement suite of equipment could visit the same sites, examine the same emissions and arrive at a substantially different conclusion. That did, apparently, happen. It is also not clear why your in situ test data was not made available following the field tests.

I also note that you mention having made measurements at 5813 Heathill Court and 509 Wyndham Drive as mentioned in my complaint and that you found no interference. I am at a loss to correlate this as neither of the Amateur licensees can confirm that you listened via their equipment. I can only assume that you made street-level measurements with some sort of mobile antenna at or near the addresses mentioned and were unable to discern any interference. I assert that a street level measurement with a mobile antenna is NOT representative of a similar measurement made with a dipole antenna, elevated above the earth.

Overall, I feel that, somehow, your measurement efforts became distorted and that your conclusions, however well intentioned, fall short of a scientifically supportable investigation. The bottom line, Mr. Franca, resolves to this: under the current Part 15 rules, any device that causes harmful interference and fails mitigation attempts must be shut down. I can find no justification for any other outcome and I, therefore, again respectfully demand that the FCC follow it's own Rules and precedents and issue a Cease and Desist order against Progress Energy Corporation in that matter. That Progress Energy Corporation supposes that it might shut down the BPL systems over time is of no consequence. These systems do, today, produce harmful interference and must be shut down

immediately. The attempts at "notching" are not effective in removing harmful interference emitted by the subject BPL systems.

Beyond this, I further note that **although access BPL is a Part 15 emitter and NOT a Shared Service, it should AT LEAST be mandated to follow Commission Rules in Shared Service situations where the Secondary emitter is not permitted to raise the interference level above 1 (one) dB. A recent NTIA report indicated that even a 1 dB increase in noise poses a slight risk of harmful interference. Clearly, a 14 dB increase will interfere with many signals that are routinely used in the Amateur Radio Service.** Clearly, as shown in my observations, the BPL signals are at least 14 dB above an average background level. That they might be 24 dB below some stated level suggests that the BPL system operator/manufacturer is short of the needed interference attenuation by at least 14 dB. Further, as the particular reference locations within these tests were not electrically "quiet" in a general sense, it follows that achieving a non-interfering status in a more quiet location would require more than the aggregate 38 dB of notch depth suggested by my test alone; indeed, as much as 45 dB or more will likely be required.

Should you or your staff wish to again visit the subject BPL trial areas, with reasonable notice, I will be happy to meet with you and escort you through these areas, while you operate my equipment and observe the harmful interference in the same manner that I have done.

Respectfully,

Thomas A. Brown
Amateur Radio Licensee N4TAB
5525 Old Still Rd.
Wake Forest, NC 27587

Attachments:
Representative List of Offending BPL Signals At Several Sites in South Wake County, NC
Text of my original complaint of April 27, 2004
Text of B. Franca letter of July 22, 2004

Representative List of Offending BPL Signals At Several Sites in South Wake County, NC

The measurements and observations listed in this document were made on August 29, 2004. Measurements were made using the apparatus as shown in Figure 1 of the related document to which this is attached.

NOTE THAT WHILE MANY FREQUENCIES WERE OBSERVED AS HAVING HARMFUL BPL INTERFERENCE, ONLY A FEW ARE LISTED HEREIN.

Holland Church Road - overhead BPL system. On frequency 21024 kHz, BPL carriers produced an offending and harmful interference at distances of more than 30 feet from the "injected" power line, with radiation peaks occurring periodically along the line and not just at the injector point. The level of attenuation required to reduce the offending BPL signal to the equivalent background noise level was 16 dB.

Feldmen Rd. - underground BPL system. Observations and measurements were made on Feldmen Rd., which is a part of the Holland Church Rd. system. At 1140 Feldmen Rd., within 50 feet of a ground mounted pedestal, harmful BPL signals were observed on 3869 kHz and required 16 dB of attenuation to reach the equivalent background noise level.

1505 Harvey Johnson Rd., one block North of 1140 Feldmen Rd., the 3869 kHz signal was heard at the same level as near the 1140 Feldmen Rd pedestal and also required 16 dB of attenuation to reduce the harmful interference to the equivalent background noise level.

Holland Church Rd. at the Donneymead Intersection, there was sufficient BPL carrier on 3869 kHz to require 13 dB of attenuation to reduce to the equivalent background noise level. Note that this is several blocks removed from the emitter.

James Slaughter Rd. Overhead BPL system feeding underground systems at Woodchase and Whitehurst subdivisions. Near the entrance to the Woodchase subdivision, offending BPL carriers were observed at 24890 - 24990 kHz and 7296 kHz, both of which required 16 dB of attenuation to reduce to the equivalent background noise level.

Interestingly, I noted that the 12 meter (24890 - 24990 kHz) signals were propagated for more than 1 mile along Hwy 55 (W) at least to Dickens Rd. All along the route along Hwy 55 to Dickens Rd. and NE on Dickens Rd. to the intersection with James Slaughter Rd. the BPL interference was at a sufficient level to require 16 dB of attenuation to reduce the BPL signal to the equivalent background noise level.

Attachment: Copy of my formal complaint of April 22, 2004

To:
James Burtle, FCC
Alan Stillwell, FCC
Ann Wride, FCC
Riley Hollingsworth, FCC
Len Anthony, Progress Energy Corporation
Matt Oja, Progress Energy Corporation
Bill Godwin, Progress Energy Corporation
Chris Imlay, ARRL Counsel

Date: April 27, 2004

This complaint addresses the Progress Energy (Raleigh, NC) BPL trial areas situated along James Slaughter Road in southern Wake County, NC. This complaint should be considered in concert with previous complaints lodged with Progress Energy and The Federal Communications Commission regarding interference by devices operating under FCC Part 15 and which radiate harmful interference into the RF spectrum allocated to, and used by licensees of the Amateur Radio Service.

Notwithstanding previous efforts by Progress Energy and it's vendor, Amperion, Inc. to resolve outstanding complaints regarding interference to Amateur Radio spectrum, a recent correspondence from Mr. Len Anthony of Progress Energy states that his company's efforts had yielded results suitable to Progress Energy and that they would take no further action in this regard. This correspondence coldly and effectively terminates the good faith relationship that was engendered in October, 2003 with a view toward a cooperative effort that might yield a technical solution to an otherwise mutually adversarial situation.

In assessing the current technical aspects of the Progress Energy BPL trials, I believe that the interference described in this and previous complaints falls under Part 15 for the following reasons:

1) The Experimental license WD2XCA issued to Progress Energy (file number 0011-EX-PL-2003-granted February 10, 2003) allows operation of an experimental
radiator within a 20 mile radius of the coordinates N35:56:58, W78:34:23. None of the 3 trial sites in southern Wake County are within this radius.

2) Mr. Len Anthony's correspondence of April 20, 2004 specifically refers to FCC Rules, Part 15 as their model for compliance.

Therefore, my complaint is that Progress Energy's BPL trial site(s) emit radiated RF components that are harmful to the spectrum allocated to the Amateur Radio Service by the FCC and also provided under international treaty.

In preface to the specifics of my complaint, I would like to put into perspective, the use of an Amateur Radio HF mobile radio in the trial areas. As it is remarkably convenient that there are only a small number of Amateur Radio operators geographically situated near the trial areas to hear

the BPL signals from their homes, we have been,and are, using mobile HF equipment in the place of fixed installations in order to gauge the impact of interference in the respective geographical areas. Thus, an HF mobile radio, in the current context, is a "stand-in" for a fixed station at or near the same geographic location. It should be noted that, due to the generally poor efficiency and polarization of the HF mobile antennas, the results reported herein significantly *under-represent* the signal levels that would be encountered by fixed stations using horizontally polarized antennas, such as wire dipoles or directional arrays, operating in the same vicinity.

On Sunday, April 25, 2004, I drove my vehicle to the James Slaughter Road trial-site area. Upon arrival near the entrance to the Whitehurst residential subdivision, I began tuning through the allocated Amateur Radio bands and immediately observed significant interference to the 12 meter band, which extends from 24.890 mHz to 24.990 mHz. The interference was sufficient to mask, and did mask, useful signals that were clearly heard away from the BPL trial area. That the unique RF "signature" of the Progress Energy equipment completely blankets and renders useless an otherwise useful spectrum segment, clearly constitutes harmful interference.

This interference accrues into other portions of the allocated Amateur Radio HF spectrum, as well. Within the Whitehurst and Woodchase subdivisions (both adjacent to James Slaughter Road) BPL interference can be heard in the lower 25 kHz of the 10 meter band (28.000 mHz to 28.025 mHz).. In addition,
near the entrance to the Whitehurst subdivision, the entire 40 meter band (7.000 mHz to 7.300 mHz) is obscured by BPL interference. This interference does not radiate from the overhead wires alone; radiation also occurs from the pedestals where the underground wiring connects to customer distribution equipment.

Note that this interference is not confined to a single, narrow tone (carrier) as would be experienced from a typical Part 15 device such as an answering machine. This BPL interference signature consists of carriers spaced at approximately 1 kHz intervals through the entire 12 meter band, rendering normal communications operation impossible.

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Members of the local Amateur Community, including the undersigned, have waited patiently for several months while Progress Energy and it's vendor have attempted, in fits and starts, to remove the allocated Amateur Radio spectrum from that spectrum utilized by their installed BPL systems. The result, after these months of observation, is that

Progress Energy has not caused these systems to cease interference to the Amateur Radio spectrum.

There is a single conclusion that can be drawn from the history of this situation: interference from this type of system is a function of the design and cannot be mitigated, else it would have been accomplished by now. Further, it seems that this technology is quite immature and inherently lacking the technological merits so widely accorded it, owing to the lack of success following months of efforts toward effecting a solution.

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I, therefore, respectfully demand that the Federal Communications Commission take the action specified under Part 15.5c and cause Progress Energy to cease operation of the Part 15 devices mentioned in this correspondence.

Respectfully,

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[Revision note: Paragraph 9 had two typographical errors that were subsequently mentioned in a follow-on errate email. Corrections were made in the foregoing paragraph 9 (only) and are underlined in both cases.}

Attachment: Copy text of letter received from Bruce Franca dated July 22, 2004

Thomas A. Brown, Amateur Radio Licensee N4TAB
5525 Old Still Rd.
Wake Forest, NC

Dear Mr. Brown:

This responds to your correspondence dated April 27, 2004, concerning a complaint with regard to harmful interference to Amateur Radio Service operations from Progress Energy Corporation's Broadband over Power Lines (BPL) trials in Southern Wake County, North Carolina. You state that on April 25, 2004, you drove your vehicle to the James Slaughter Road area and observed that the BPL trials being conducted by Progress Energy in that area "emit radiated RF components that are harmful to spectrum allocated the Amateur Radio Service." You state that the unique RF "signature" of the Progress Energy BPL equipment completely blankets, and therefore causes harmful interference to, several Amateur HF bands.

During the period June 28 and July 2, 2004, personnel from the FCC's Office of Engineering and Technology and Enforcement Bureau, including myself, traveled to North Carolina and undertook extensive testing and measurements of Progress Energy's BPL system deployed near Raleigh in the areas described in your complaint. We first conducted compliance testing of BPL overhead injectors on Slaughter Road and on Holland Church Road. In both instances, these devices were found to be in compliance with the FCC emission limits.

As part of these measurements, we examined the effectiveness of Progress Energy's steps to "notch" its BPL signals to avoid harmful interference. Section 2.1 of the Commission's rules defines harmful interference as "[i]nterference which ... seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service," 47 C.F.R. § 2.1. The notch depth of the Holland Church Road injector was measured in two ways: 1) evaluating spectrum band averages using a bicon antenna and 2) evaluating OFDM peaks using a loop antenna. The results of these measurements indicated a notch depth of 23.4 to 25.0 dB below the Part 15 limits, with an average of 24 dB below. Given the relatively low levels of emissions permitted by BPL systems under the Part 15 rules and the distribution and propagation of the BPL signals of the Progress Energy system, notching at this level is sufficient to eliminate any signals that would be deemed capable of causing harmful interference, including interference to amateur operations. Measurements and observations with test equipment and a high quality amateur receiver show little field strength or observable signal levels in the notched bands. In no instances were signal levels found that would cause serious degradation, obstruction, or repeated interruption of the communications of amateur mobile stations or the fixed stations identified in your complaint. We did, however, find that the notching in the 10 meter band as implemented by Progress Energy allowed somewhat higher levels of signal in the lower 100 kHz at 28.0-28.1 MHz than the 24 dB notching reduction generally observed.